

**REMARKS**

**Status of the Claims:**

Claims 41, 43, 45-53, 55 – 69, 71 and 72 are currently pending.

Claims 42, 44, and 54 are cancelled.

Claims 50-54, 56 – 67 and 71 – 72 are withdrawn from consideration.

Claims 41, 46, and 49 are currently amended. Claim 50 and 55 are withdrawn and currently amended.

**Amendments to the Claims:**

No new matter has been introduced by way of the claim amendments.

Claim 41 is currently amended to recite that the carbon nanotubes are silane-functionalized with an organosilane species and are covalently bound to the fiber reinforcement material via the organosilane species. Claims 46, and 49 have been amended for consistency with Claim 1. Claim 42, reciting that the carbon nanotubes are silane-fucntionalized, has been cancelled. Claim 44, reciting that the fiber reinforcement material is silane-functionalized, is cancelled. Withdrawn claim 50 is presently amended in a manner identical to that of claim 41. Claim 55 has been amended for consistency with Claim 50. Claim 54, reciting that the carbon nanotubes are silane-fucntionalized, has been cancelled. No new matter is added.

**I. 35 U.S.C. § 112 Rejections**

Claims 41-49, 68, and 69 are rejected under 35 U.S.C. § 112 for omitting essential elements. The Examiner has asserted that based on Applicants' specification and on Applicants' submission of June 28, 2010, in order for the carbon nanotubes to bond to both the fiber reinforcement material and the polymer, both the fiber reinforcement material and the carbon nanotubes are required to be silane-functionalized.

In response, Applicants respectfully assert that this rejection is moot in light of Applicants' amendments to claims 41 and 50 to recite that the carbon nanotubes are silane-functionalized with an organosilane species and are covalently bound to the fiber reinforcement material via the organosilane species.

## **II. 35 U.S.C. § 102/103 Rejections Over *Ton-That* or *Ton-That* in view of *Flautt***

Claims 41, 42, and 44-47 stand rejected under 35 U.S.C. § 102(e) as anticipated by or, in the alternative, obvious under 35 U.S.C. § 103(a) over United States Patent publication 2005/0191490 (hereinafter, *Ton-That*) in view of USPN 6,270,897 to Flautt (hereinafter *Flautt*). Applicants respectfully traverse the rejection of these claims in view of the remarks and amendments presented herein.

### *II.1 Standard of Review*

The standard of review for establishing anticipation under 35 U.S.C. § 102 is set forth as follows: "[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987); MPEP § 2131.

For rejections made under 35 U.S.C. § 103(a), all claim limitations must be taught or suggested by the prior art to establish obviousness. *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974). Furthermore, "[r]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness". *KSR Int'l Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1741 (2007) citing with approval *In re Kahn*, 441 F.3d 977, 988 (CA Fed. 2006). Likewise, in issuing rejections under 35 U.S.C. § 103(a), the Examiner must consider an invention and the prior art as a whole in accordance with the requisite *Graham* factual inquiries. M.P.E.P. § 2141; *Ruiz v. A.B. Chance Co.* 69 U.S.P.Q.2d 1686, 1690 (Fed. Cir. 2004).

Furthermore, "[a] rationale to support a conclusion that a claim would have been obvious is that all the claimed elements were known in the prior art and one skilled in the art could have

combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded nothing more than predictable results to one of ordinary skill in the art." M.P.E.P. § 2143.02. Although "[o]bviousness does not require absolute predictability...at least some degree of predictability is required." *Ibid*.

## *II.2 Claims 41, and 45-47 Are Not Anticipated or Obvious*

Applicants respectfully assert that claims 41, 45-47 are not obvious, because *Ton-That* does not teach or suggest all the required limitations of independent claim 41, as this claim presently stands amended. Applicants have amended independent claim 41 to clarify that the carbon nanotubes are covalently bound to the fiber reinforcement material via an organosilane species. As set forth hereinbelow, Applicants respectfully assert that *Ton-That* fails to teach or suggest a composite material in which carbon nanotubes are covalently bound to both a fiber reinforcement material and a polymer, particularly where the carbon nanotubes are covalently bound to the fiber reinforcement material via an organosilane species.

Applicants reiterate that although *Ton-That* may teach covalent bonding of a graft copolymer to carbon nanotubes and the polymer matrix, this reference is completely silent regarding **covalent** bonding of any kind between carbon nanotubes and a fiber reinforcement material. Accordingly, there is also no teaching in *Ton-That* to the effect that the carbon nanotubes are covalently bound to a fiber reinforcement material via an organosilane species. *Flautt* does not cure this defect. Although *Flautt* may teach sizing glass fibers with an organosilane and bonding the sized glass fibers to an epoxy, this reference is also completely silent regarding **covalent** bonding of any kind between a fiber reinforcement material and carbon nanotubes. Accordingly, there is also no teaching in *Flautt* to the effect that the fiber reinforcement material is covalently bound to carbon nanotubes via an organosilane species.

In view of the foregoing remarks and amendments, Applicants respectfully assert that independent claim 41 is not anticipated or rendered obvious by *Ton-That* or *Ton-That* in view of *Flautt*, since all claim limitations are not taught or suggested. Claims 42 – 49, 68 and 69 depend either directly or indirectly from patentable claim 41 and are patentable for at least the same reasons. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). Therefore, Applicants

respectfully request that the Examiner's rejection of claims 41, 42, 45 and 47 under 35 U.S.C. § 102(e)/103(a) be withdrawn.

### *II.3 Withdrawn Claims 50 – 53, 55- 67, 71 and 72 Are Not Anticipated or Obvious*

Applicants also respectfully assert that withdrawn claims 50 – 67, 71 and 72 are not anticipated or rendered obvious by *Ton-That*, since all limitations of independent claim 50 are not taught or suggested. Specifically, Applicants have amended independent claim 50 to require that the carbon nanotubes carbon nanotubes are covalently bound to the fiber reinforcement material via an organosilane species. For at least the reasons noted above, *Ton-That* fails to teach or suggest covalent bonding to a fiber reinforcement material via an organosilane species.

In view of the foregoing remarks, Applicants respectfully assert that independent claim 50 is not anticipated or rendered obvious by *Ton-That*, since all claim limitations are not taught or suggested. Claims 51 – 67, 71 and 72 depend either directly or indirectly from patentable claim 50 and are patentable for at least the same reasons.

## **III. 35 U.S.C. § 103 Rejections**

### *III.1 Claim 43 Rejected Over Ton-That In View Of Flautt and Further in View of Ajayan*

Claim 43 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over *Ton-That* in view of Flautt and further in view of Ajayan, *et al.*, "Single-Walled Carbon Nanotube-Polymer Composites: Strength and Weakness", *Adv. Mater.*, 12:2000, pp. 750-753 (hereinafter, *Ajayan*). Applicants respectfully traverse the rejection of this claim in view of the remarks and amendments presented herein.

#### *III.1.1 Claim 43 is Not Obvious*

Applicants respectfully assert that claim 43 is not obvious, since claim 41, from which claim 43 depends, is not obvious in view of *Ton-That* and *Flautt* and *Ajayan*. Specifically, *Ton-That*, *Flautt* and *Ajayan* fail to collectively teach or suggest all of the limitations of amended claim 41. As set forth in detail hereinabove, Applicants have established that *Ton-That* does not teach or suggest a composite material in which the carbon nanotubes are covalently bound to a

fiber reinforcement material via an organosilane species. *Ajayan* fails to remedy the noted deficiencies of *Ton-That*, since *Ajayan* is silent on the presence of a fiber reinforcement material. Hence, *Ajayan* also fails to teach or suggest covalent bonding of carbon nanotubes to a fiber reinforcement material via an organosilane species.

In view of the foregoing remarks and amendments, Applicants respectfully assert that independent claim 41 is not obvious in view of *Ton-That* and *Ajayan*, since all claim limitations are not taught or suggested. Claims 43, 45 – 49, 68 and 69 depend either directly or indirectly from non-obvious claim 41 and are not obvious for at least the same reasons. Therefore, Applicants respectfully request that the Examiner's rejection of claim 43 under 35 U.S.C. § 103(a) be withdrawn.

### *III.1.2 Withdrawn Claims 50 – 53, 55– 67, 71 and 72 Are Not Obvious*

Applicants also respectfully assert that withdrawn claims 50 – 53, 55 – 67, 71 and 72 are not obvious in view of *Ton-That*, *Flautt*, and *Ajayan*, since all limitations of amended independent claim 50 are not taught or suggested. Specifically, Applicants have amended independent claim 50 to require that the carbon nanotubes carbon nanotubes are covalently bound to the fiber reinforcement material via an organosilane species. As noted hereinabove, *Ton-Tha*, *Flautt*, and *Ajayan* fail to teach or suggest these required claim elements.

In view of the foregoing remarks, Applicants respectfully assert that independent claim 50 is not rendered obvious by *Ton-That* and *Ajayan*, since all claim limitations are not taught or suggested. Claims 51, 52, 53, 55– 67, 71 and 72 depend either directly or indirectly from patentable claim 50 and are patentable for at least the same reasons.

### *III.2 Claims 48 and 49 Rejected Over Ton-That In View Flautt and Further in View of Of Phillips*

Claims 48 and 49 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Ton-That* in view of *Flautt* and further in view of United States Patent 3,312,569 (hereinafter, *Phillips*). Applicants respectfully traverse the rejection of these claims in view of the remarks and amendments presented herein.

*III.2.1 Claims 48 and 49 Are Not Obvious*

Applicants respectfully assert that claims 48 and 49 are not obvious, since claim 41, from which these claims depend, is not obvious in view of *Ton-That*, *Flautt*, and *Philipps*. Specifically, *Ton-That*, *Flautt* and *Philipps* fail to collectively teach or suggest all limitations of amended claim 41. As set forth in detail hereinabove, Applicants have established that *Ton-That* does not teach or suggest a composite material in which the carbon nanotubes are covalently bound to a fiber reinforcement material via an organosilane species. *Philipps* fails to remedy the noted deficiencies of *Ton-That* and *Flautt*, since, at a minimum, *Philipps* is silent regarding carbon nanotubes.

In view of the foregoing remarks and amendments, Applicants respectfully assert independent claim 41 is not obvious in view of *Ton-That*, *Flautt* and *Philipps*, since all claim limitations are not taught or suggested. Claims 48 and 49 depend either directly or indirectly from non-obvious claim 41 and are not obvious for at least the same reasons. Therefore, Applicants respectfully request that the Examiner's rejection of claims 48 and 49 under 35 U.S.C. § 103(a) be withdrawn.

*II.3.2 Withdrawn Claims 50-53, 55 – 67 and 71 – 73 Are Not Obvious*

Applicants also respectfully assert that withdrawn claims 50- 53, 55 – 67, 71 and 72 are not obvious in view of *Ton-Tha*, *Flautt*, and *Philipps*, since all limitations of amended independent claim 50 are not taught or suggested. Specifically, Applicants have amended independent claim 50 to require that the carbon nanotubes are covalently bound to the fiber reinforcement material via an organosilane species. As noted above, *Ton-That* and *Ton-That* in view of *Flautt* fail to teach or suggest covalent bonding of carbon nanotubes to a fiber reinforcement material via an organosilane. *Philipps* fails to remedy the noted deficiencies of *Ton-That*, since, at a minimum, *Philipps* is silent regarding carbon nanotubes.

In view of the foregoing remarks, Applicants respectfully assert that independent claim 50 is not rendered obvious by *Ton-That*, *Flautt*, and *Philipps*, since all claim limitations are not taught or suggested. Claims 51-53, 55 – 67, 71 and 72 depend either directly or indirectly from patentable claim 50 and are patentable for at least the same reasons.

*III.3 Claims 68 and 69 Rejected Over Ton-That In View Flautt and Further in View Of Velasco-Santos*

Claims 68 and 69 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Ton-That* in view of *Flautt* and further in view of Velasco-Santos, *et al.*, "Chemical Functionalization of Carbon Nanotubes Through an Organosilane", *Nanotechnology*, 13:2002, pp. 495-498 (hereinafter, *Velasco-Santos*). Applicants respectfully traverse the rejection of these claims in view of the remarks and amendments presented herein.

*III.3.1 Claims 68 and 69 Are Not Obvious*

Applicants respectfully assert that claims 68 and 69 are not obvious, since claim 41, from which these claims depend, is not obvious in view of *Ton-That* and *Velasco-Santos*. Specifically, *Ton-That* and *Velasco-Santos* fail to collectively teach or suggest all limitations of amended claim 41. As set forth in detail hereinabove, Applicants have established that *Ton-That* does not teach nor *Ton-That* in view of *Flautt* suggest a composite material in which the carbon nanotubes are covalently bound to the fiber reinforcement material via an organosilane species. *Velasco-Santos* fails to remedy the noted deficiencies of *Ton-That* and *Flautt*, since *Velasco-Santos*, at a minimum, does not teach or suggest covalent bonding to a fiber reinforcement material. *Velasco-Santos* only suggests covalent bonding of the carbon nanotubes to the polymer (see *Velasco-Santos*, page 495, Col. 2). *Velasco-Santos* is silent regarding a fiber reinforcement material. Therefore, the cited references as a whole fail to teach or suggest covalent bonding to a fiber reinforcement material via an organosilane species.

In view of the foregoing remarks, Applicants respectfully assert that independent claim 41 is not obvious in view of *Ton-That*, *Flautt*, and *Velasco-Santos*, since all claim limitations are not taught or suggested. Claims 68 and 69 depend either directly or indirectly from non-obvious claim 41 and are not obvious for at least the same reasons. Therefore, Applicants respectfully request that the Examiner's rejection of claims 68 and 69 under 35 U.S.C. § 103(a) be withdrawn.

In addition to the foregoing remarks, Applicants also respectfully assert that the product-by-process limitation of claim 68 yields a materially different carbon nanotube product than that

taught by the cited references. Claim 68 requires that the hydroxyl-functionalized carbon nanotubes are formed from fluorinated carbon nanotubes by reacting a reagent selected from the group consisting of a mono-metal salt of a dialcohol, a mono-metal salt of a multi-alcohol, and an amino alcohol. The structures of such hydroxyl-functionalized carbon nanotubes are illustrated in FIGURES 1 and 2 and are described in more detail in WO 05/028740 (of record, Applicants IDS of November 21, 2007). In contrast, *Velasco-Santos* teaches hydroxyl-functionalized carbon nanotubes that have been surface oxidized to produce hydroxyl groups thereon (see *Velasco-Santos*; page 496, Col. 1, first paragraph and Figure 1 therein). Accordingly, the hydroxyl-functionalized carbon nanotubes of claim 68 and those of *Velasco-Santos* are materially different, since the hydroxyl groups of *Velasco-Santos* are directly on the carbon nanotubes, whereas those of claim 68 are appended to the carbon nanotubes through an alkyl linker species. Furthermore, paragraph [0053] of the instant specification succinctly describes how the presently claimed carbon nanotubes differ from those of *Velasco-Santos*.

### *III.3.2 Withdrawn Claims 5-53, 55 – 67, 71 and 72 Are Not Obvious*

Applicants also respectfully assert that withdrawn claims 50 – 53, 55 – 67, 71 and 72 are not obvious in view of *Ton-That* and *Velasco-Santos*, since all limitations of amended independent claim 50 are not taught or suggested. Specifically, Applicants have amended independent claim 50 to require that the carbon nanotubes are covalently bound to the fiber reinforcement material via an organosilane species. As noted above, *Ton-That* and *Flautt* fails to teach or suggest covalent bonding to a fiber reinforcement material via an organosilane species. As also noted above, *Velasco-Santos* also fails to teach or suggest either a fiber reinforcement material or covalent bonding of carbon nanotubes thereto via an organosilane species.

In view of the foregoing remarks, Applicants respectfully assert that independent claim 50 is not rendered obvious by *Ton-That* and *Velasco-Santos*, since all claim limitations are not taught or suggested. Claims 51– 53, 55– 67, 71 and 72 depend either directly or indirectly from patentable claim 50 and are patentable for at least the same reasons.



*III.4 Claims 68 and 69 Rejected Over Ton-That In View Of Flautt and Applicants' Specification and Velasco-Santos*

Claims 68 and 69 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Ton-That* in view of *Flautt* and *Velasco-Santos* and Applicants' specification. Applicants respectfully traverse the rejection of these claims in view of the remarks and amendments herein.

*III.4.1 Claims 68 and 69 Are Not Obvious*

Applicants respectfully assert that claims 68 and 69 are not obvious in view of *Ton-That*, *Flautt*, *Velasco-Santos* and Applicants' specification, since all limitations of amended claim 41 are not taught or suggested by the cited references. As set forth hereinabove, claim 41 is not obvious in view of *Ton-That* and *Velasco-Santos*, and Applicants' remarks to that effect are reiterated *in toto*. Applicants further respectfully assert that the specification does not contain admitted prior art that remedies the deficiencies of *Ton-That* and *Velasco-Santos* in regard to claim 41. Specifically, none of *Ton-That*, *Velasco-Santos* or admitted prior art in Applicants' specification teach or suggest covalent bonding of carbon nanotubes to a fiber reinforcement material, particularly via an organosilane species.

In view of the foregoing remarks, Applicants respectfully assert that independent claim 41 is not obvious in view of *Ton-That*, *Flautt*, *Velasco-Santos* and Applicants' specification, since all claim limitations are not taught or suggested. Claims 68 and 69 depend either directly or indirectly from non-obvious claim 41 and are not obvious for at least the same reasons. Therefore, Applicants respectfully request that the Examiner's rejection of claims 68 and 69 under 35 U.S.C. § 103(a) be withdrawn.

*III.4.2 Withdrawn Claims 50 – 53, 55- 67, 71 and 72 Are Not Obvious*

Applicants also respectfully assert that withdrawn claims 50 – 55, 55 – 67, 71 and 72 are not obvious in view of *Ton-That*, *Flautt*, *Velasco-Santos* and Applicants' specification, since all limitations of amended independent claim 50 are not taught or suggested. As set forth hereinabove, none of *Ton-That*, *Flautt*, *Velasco-Santos* or admitted prior art in Applicants'

specification teach or suggest covalent bonding of carbon nanotubes to a fiber reinforcement material, particularly via an organosilane species.

In view of the foregoing remarks, Applicants respectfully assert that independent claim 50 is not rendered obvious by *Ton-That*, *Flautt*, *Velasco-Santos* and Applicants' specification, since all claim limitations are not taught or suggested. Claims 51 – 53, 55 – 67, 71 and 72 depend either directly or indirectly from patentable claim 50 and are patentable for at least the same reasons.

### **CONCLUSIONS**

Claims 41, 43, 45 – 49, 68 and 69 are presently pending in the application. Applicants respectfully submit that claims 41, 43, 45 – 49, 68 and 69, as these claims presently stand amended, are in a condition for allowance based on the remarks presented hereinabove. Furthermore, Applicants respectfully request that withdrawn method claims 50 – 53, 55 – 67, 71 and 72 be considered for rejoinder upon allowance of claims 41, 43, 45 – 49, 68 and 69, as required in MPEP 821.04.

The Director is hereby authorized to charge any fees or credit any overpayment due to Deposit Account Number 23-2426 of Winstead PC (referencing matter number 11321-P074WOUS).

If the Examiner has any questions or comments concerning this paper or the present application in general, the Examiner is invited to call the undersigned at (713) 650-2780.

Respectfully submitted,

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